

Statistical Manufacturing Cell/Process Qualification Sample Size Optimization

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Abstract : In production operations/manufacturing, a cell or line is typically a bunch of similar machines (computer numerical control (CNCs), advanced cutting, 3D printing or special purpose machines. For qualifying a typical manufacturing line /cell / new process, Ideally, we need a sample of parts that can be flown through the process and then we make a judgment on the health of the line/cell. However, with huge volumes and mass production scope, such as in the mobile phone industry, for example, the actual cells or lines can go in thousands and to qualify each one of them with statistical confidence means utilizing samples that are very large and eventually add to product /manufacturing cost + huge waste if the parts are not intended to be customer shipped. To solve this, we come up with 2 steps statistical approach. We start with a small sample size and then objectively evaluate whether the process needs additional samples or not. For example, if a process is producing bad parts and we saw those samples early, then there is a high chance that the process will not meet the desired yield and there is no point in keeping adding more samples. We used this hypothesis and came up with 2 steps binomial testing approach. Further, we also prove through results that we can achieve an 18-25% reduction in samples while keeping the same statistical confidence.

Keywords : statistics, data science, manufacturing process qualification, production planning

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